Effects of preparing process on the properties of

o-LiMnO₂ via Pechini's method

T. S. Chou, W. K. Pang, S. H. Wu

Department of Materials Engineering, Tatung University,

Taipei City 104, Taiwan (R.O.C)

Abstract

Orthorhombic LiMnO₂ (o-LiMnO₂) with space group Pmmn is one of the promising candidates to replace currently commercial cathode materials for lithium ion batteries due to its high theoretical capacity of ~285 mAh/g, low cost, long cycle life, and environmental friendliness.¹⁻³ To prepare single phase *o*-LiMnO₂, certain methods, such as solid-state reaction,⁴ hydrothermal synthesis,^{5,6} and sol-gel process,⁷ have been developed. Among them, it is generally accepted that sol-gel process offer finer particle size and better electrochemical properties than others.⁸ In this study, o-LiMnO₂ compounds are prepared via a Pechini's method. The chelating processes between cationic ions and citric acid and polymerization of citric acid-based complexes with ethlylene glycol involved in the Pechini's process is directly relevant to the stacking faults and cationic mixing/ordering of the prepared samples. By varying the degrees of chelation and polymerization, o-LiMnO₂ samples with various levels of cationic mixing and stacking faults are prepared. The crystallography and electrochemical properties of the prepared samples are investigated by the means of XRD, XAS, SEM, TEM, and galvanostatic cycling. Fig. 1 shows the XRD results and the measured intensity ratio of (010)/(110) and the peak width (full-width at half-maximum FWHM) of 110 reflection are taken to unveil the structural disorderness of Li, Mn, and O in the orthorhombic structure. Additionally, the results of XAS, SEM, TEM, and electrochemical measurements will be added, served as complementary, and discussed along with the observed structural disorderness. The outcome of the study is

expected to offer a more comprehensive and advanced understanding on the potential *o*-LiMnO₂ compound.



Fig. 1 XRD results of prepared o-LiMnO₂ powders showing the variation of intensity ratio of (010)/(110).

References:

- 1. B. Ammundsen, J. Desilvestro, T. Groutso, D. Hassell,
- J. B. Metson, E. Regan, R. Steiner, and P. J. Pickering, *J. Electrochem. Soc.*, **147**, 4078 (2000).

2. S. H. Wu, and M. T. Yu, *J. Power Sources*, **165**, 660 (2007).

- Q. Liu, Y. Li , Z. Hu, D. Mao, C. Chang, and F. Huang, *Electrochim. Acta*, 53, 7298 (2008).
- M. Kanda, S. Yamada, T. Shirogami, Y. Sato, and T. Takamura, *J. Appl Electrochem.*, **12**, 599 (1982).
- 5. J. M. Kim, and H.T. Chung, *J. Power Sources*, **115**, 125 (2003).

6. Q. Liu, D. Mao, C. Chang, and F. Huang, *J. Power Sources*, **173**, 538 (2007).

- Z. P. Guo, K. Konstantinov, G. X. Wang, H. K. Liu, and S. X. Dou, *J. Power Sources*, **119**, 221 (2003).
- 8. H. Ji, G. Yang, X. Miao, and A. Hong, *Electrochim. Acta*, **55**, 3392 (2010).